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## ORIGINAL ARTICLES

### DISEASES OF THE EYES A GENERAL PRACTITIONER SHOULD KNOW\*

By DR. VITO L. RAIÀ

276 BROADWAY, PROVIDENCE, R. I.

A disease of the eyes which begins with redness of the conjunctiva is often treated by general practitioners and considered as simple cold or conjunctivitis. But redness of the eyes is not always due to a conjunctivitis but may be the consequence of an inflammation of other tissues more deeply situated, such as the iris, the choroid, the ciliary body, etc. In iritis, if the pupil is not dilated at the very beginning of the disease, adhesions and partial occlusion of it takes place, a condition which is liable to give a great deal of trouble to the patient for the rest of his life. A physician may instil atropine solution in a more or less inflamed eye. The most disastrous consequences will follow if the patient is susceptible to that serious disease called glaucoma.

Early diagnosis of the patient's condition on the part of the physician is extremely vital specially to differentiation between conjunctivitis, iritis and acute glaucoma. When the latter ailment is recognized or suspected no time should be wasted in directing the patient so that he may have proper and immediate expert treatment.

Doctors on confinement cases are advised to instil nitrate of silver solution in the baby's eyes immediately after birth. But should a secretion of pus appear in the eyes after a few days the baby should be examined by an eye specialist. Children have become totally blind through the neglect or ignorance of the attending physician. I have seen some of such cases in my practice.

Ophthalmia neonatorum has given a high percentage of blindness in the past, and, although at present the Crede's method is used everywhere as prophylactic in private practice and in Lying-In Hospitals, a certain percentage, although not so

high, is still found. When a physician has a case of this sort he should inspect the eyes gently; he should not touch them nor attempt to separate the lids with force, for in doing so he may cause injury to the cornea and contribute to the ulceration and destruction of the visual organs. To open the lids of infants when the eyes are inflamed and especially when they discharge pus is a difficult and delicate matter, and it can only be skilfully and successfully done after years of practice. Even in the general hospitals it is very dangerous to leave the cleansing of the eyes and the instillation of medicines to nurses with no special training in nursing eye diseases. Much has been written and said by committees and associations for the prevention of blindness. Probably no small relief would come from the insistence that general hospitals maintain special and permanent trained eye nurses.

A few diagnostic points may be of interest to the general practitioner. The diagnosis of ophthalmia neonatorum is very easy to make; the principal symptoms are secretion of pus from the eyes and a marked swelling of the lids. How can we distinguish between conjunctivitis and iritis, between iritis and acute glaucoma? If there is redness of the eyes accompanied by secretion and agglutination of the margins of the lids in the morning it is positively either a cold or catarrhal conjunctivitis. If the eye only runs tears and the pupil is small, irregular about its margin and does not react to light, and if there is pain not only in the eye but also in the "cheek-bone" and the temple, and if there is a change of color of the iris there is indication of iritis. Atropine solution, as I have already said, must be ordered as soon as possible to dilate the pupil, otherwise this may become occluded and the eyesight more or less impaired for life. Glaucoma manifests itself principally by increased intraocular pressure in consequence of which the eye becomes hard. This increased pressure is due to diminished outflow of lymph from the eye, produced from occlusion of the canal of Schlemm at the sclero corneal region. Glaucoma is acute inflammatory, chronic inflammatory and non-inflammatory or simple. In inflammatory glaucoma the eye is red and painful as in acute iritis, the pupil not small and

\*Read before the Malpighi Medical Club of Providence at the monthly meeting, April 28, 1932.

irregular but widely dilated, and the anterior chamber is shallow. Should the patient reveal a large and oval pupil with very poor vision and no medicine has been dropped into the eyes no time should be lost. The doctor should act quickly, for an operation performed at the proper time in the majority of cases produces immediate recovery with a cessation of the pain and restoration of sight. There may be no redness of the eye, no pain whatsoever, and the patient may complain only of failing vision and of seeing colors and halos around the lights, especially in the evening. These symptoms are very likely prodromes of glaucoma, and anything that dilates the pupil, even cocaine, is liable to precipitate an acute attack of the disease. In simple glaucoma on the other hand, though the external appearance of the eye may be apparently normal, the intraocular pressure may be increased and the field of vision peculiarly altered. This latter affection is also considered by the majority of authors as the result of stoppage of the angle of filtration of the anterior chamber. To relieve it miotics are ordered for a long time and special operations are performed, very different from iridectomy, the only efficient operation for acute glaucoma.

Any physician may be called upon to remove a foreign body from the eye. If this foreign body is on the tarsal conjunctiva it is a very easy thing to alleviate the patient's suffering, but if it is embedded in the cornea its removal may be a very difficult task and should not be attempted by a general practitioner. Much injury to the eyesight has resulted from infection introduced through the corneal wound, no precautions having been taken to properly sterilize the instrument used and the wound afterward. In industrial establishments, where particles of emery, of iron, etc., are frequently being removed by fellow workmen, this practice should be discouraged, though at times it has been done with no injurious consequences. For on occasions ulceration of the cornea follows with pus in the anterior chamber which may impair vision and materially affect the earning power of the patient. These workmen should be urged, if they ever attempt to remove foreign bodies from the eyes, to sterilize at least with a flame, boiling water or pure alcohol the pointed object used by them. This should be clearly impressed by the medical profession and would doubtlessly result in a great preventive measure to reduce blindness in the community.

I referred to the danger of unskilful nurses in some general hospital in relation to ophthalmia neonatorum. A case of this affection was brought to my attention a few years ago. After a week of treatment when pus had greatly diminished the little patient was sent to a hospital. Three or four weeks later, when he was discharged from the institution, both corneae had become a mass of cicatricial tissues and blindness had set in permanently. The cornea of both eyes had evidently ulcerated and ruptured. I spoke to the visiting surgeon at the institution and he too was astonished at this terrible result.

To prove how important it is to keep trained nurses in hospitals where eye diseases are treated and specially ophthalmia neonatorum I repeat what Dr. Sanford R. Gifford says in his book of *Ocular Therapeutics*: "at one large hospital, during five years' incumbency of one efficient nurse as supervisor of the ward for ophthalmia neonatorum not a single cornea was lost except where keratitis was present on admission."

I also mentioned the injury to the visual organs from improper meddling with the eyes by some physicians. This is not so noticeable now as it was in the past, for fortunately among the present generation of physicians there is more cooperation. Following is a splendid illustration of this cooperation. A young physician had been called to see a patient, and completing his examination he was asked to visit another patient nearby suffering intense pain in her right eye. A simple glance convinced the young physician that it was something more serious than a cold of the eye. The relatives were urged to call an eye specialist immediately. The patient was removed to the Rhode Island Hospital and an operation was quickly performed. The pain subsided immediately, her sight returned and this has remained unaltered to the present date. Had the physician who first saw this patient been not so diligent and cognizant of the urgent necessity to refer this case to a specialist, the result would probably have been total blindness, specially that the other eye had already been lost from the same disease, glaucoma. Preventive measures to reduce blindness have engaged the attention of physicians, social and welfare workers for many years. Study of this problem reveals the shocking reality that the majority of cases of blindness could have been avoided under proper conditions. In consideration of this in industrial establishments there should be encouraged instructive talks to the workmen by



physicians on first aid measures in the care of their eyes when even the most trivial injuries are sustained.

In general hospitals eye cases should be examined promptly upon admission into the wards by competent experts, for as often happens, a disease not timely recognized may quickly precipitate serious consequences. On the other hand an eye from which a foreign body has been removed should be bandaged and kept so for at least 24 hours, because it is dangerous to leave the corneal wound exposed to dust and dirt, which are liable to produce an infection.

All of these measures and others will be well worth the money that may be spent to put them into effect. Finally I wish to call the attention of the general practitioners to strabismus or "cross-eye" which appears ordinarily in infancy. The affection, as a rule, is seen first by the family physician, from whose advice depends the loss or preservation of sight of one eye. Although much progress has been done in the etiology and treatment of squint, mothers are still advised by doctors to "let the child alone and to wait until he is older."

Considering that the deviating eye becomes more and more amblyopic as the years pass it is easy to understand the damage which procrastination produces to the visual organ. It is well to emphasize the necessity to begin treatment as soon as the defect is discovered, even at two or three years of age, by correcting all errors of refraction and by training the fusion faculty with orthoptic exercises. Most of the writers agree now that before the fifth year of life these exercises give very satisfactory and prompt results, while nothing can be obtained after ten or more years. To straighten the eye in these conditions with an operation does not mean that this will ever take part in binocular vision. Doctors should communicate this fact to mothers, nurses and teachers in order to urge them to send these cases as soon as discovered to the proper specialist.

I have mentioned, in relation to the prevention of blindness, iritis, glaucoma, purulent ophthalmia in infants, infection of the cornea due to improper way of removing foreign bodies and strabismus, because these affections are the only ones which, according to my experience, are occasionally seen by general practitioners and which should be recognized and properly treated at their very beginning to avoid the loss of vision. All the other diseases,

which contribute more or less to blindness in every community, are rarely seen by the general practitioners, as they are either neglected for some time by the patients themselves or are treated by competent specialists.

### ORAL MANIFESTATIONS OF SYSTEMIC DISEASE\*

By ALEX. M. BURGESS, M.D.

454 ANGELL STREET, PROVIDENCE, R. I.

When in a stroll at night in a strange city, one chances to find himself looking in through the open window upon a lighted room of a dwelling house he is likely to speculate somewhat as to the inhabitants, constructing in his mind as he passes on in the darkness an elaborate picture of the family life which goes on within, and based wholly on the details that are visible in that one room. In much the same way but with vastly greater accuracy you who practice medicine and surgery in the dental field, gazing as you must long and earnestly in at the oral window, can discern much that is going on, indeed detecting at times the earliest evidences of general disease processes of the utmost importance. While, as dental specialists, you are in the habit of detecting infections and other abnormalities of the teeth which have the greatest interest to the medical man as related to disease elsewhere, you also have the opportunity at times, by the recognition of pathological conditions of other structures within view, such as the tongue, the gums or the lips, to point the way to the diagnosis of serious illness of the greatest possible concern to the patient and his physician. It is with this latter phase of your work that this discussion is concerned.

If, then, as we peer through the oral window we look about at the structures which merit our scrutiny, omitting of course the teeth, we have to consider first the mucous membranes generally, as to color, moisture, ulcerations, pigmentation and exudates, and next, the various special structures of interest, particularly the tongue, the gums, the lips and the collections of lymphoid tissues of the pharynx of which the most important are the faucial tonsils.

\*Address to the New England Dental Society, Boston, October 18, 1933.

### *The Mucous Membranes*

The oral mucosa is normally pink because of the blood in the submucous capillaries. Thus a general pallor of these surfaces is ordinarily a sound indication of a decrease in hemoglobin in the blood stream, that is, an anaemia. An anaemia always demands medical investigation. In the same way cyanosis, a purplish coloration of the mucous membranes, usually best seen in the lips or occasionally the tongue, is due to an insufficient oxidation of blood hemoglobin, an anoxaemia, which, when persistent, is caused in the majority of instances by serious chronic disease of the heart or lungs. Again, dryness of the mucous membranes is the best indication of a depletion of body fluids, a dehydration which is seen in severe untreated diabetes as well as in uraemia, prolonged vomiting or fever, and also indeed in persons with nasal obstruction who are forced to breathe through their mouths. Brownish pigmentation of the oral mucosa, seen in adrenal insufficiency (Addison's Disease) may give the key to the diagnosis. Ulcerations, exudations and deposits on the gums, tongue and elsewhere, while often evidence of purely local processes, may also be merely local expressions of general infections, toxaeemias, poisoning by various chemical agents, dietary deficiencies or serious disease of the blood forming tissues, the timely recognition of which may be not only important but even at times life-saving.

### *The Tongue*

Of the specialized structures with which we must deal the tongue is the most interesting and important. From ancient times the first request of the doctor to the patient whom he is to examine has been "Stick out your tongue!" And what does the doctor see? A "coated" tongue perhaps, that is to say, a tongue the upper surface of which is covered with furry or slimy, whitish or grayish material. This appearance, which is usually associated in the minds of the laity with indigestion and constipation is seen in many fevers and in gastro-intestinal disorders, especially, as pointed out by Oatway and Middleton, in those associated with gastric hyper — rather than hypo-acidity. On the other hand a decrease in gastric acidity ordinarily goes with a tendency to smoothness of the tongue with atrophy of papillae. Other changes in the appearance of the tongue surface such as the fissured or "scrotal" tongue and the irregularity denuded or "geographical" tongue are of less sig-

nificance. A disturbance in motility or sensation usually indicates a well marked disorder of the nervous system either organic or functional; as for example, the protrusion to one side associated with hemiplegia, and the anaesthetic tongue seen at times in hysteria. Ulceration and inflammation of the tongue will be discussed along with similar conditions elsewhere in the mouth as associated with other oral manifestations of general disease.

### *Infections of Oral and Pharyngeal Mucosa*

While it is our main interest to consider those oral manifestations which may suggest systemic disease, it will be well first to consider briefly some of the processes in which the infecting organisms themselves produce lesions in the mouth or throat. Without attempting to describe them in detail we may mention as producing ulcers characterized by marked induration, which at times makes them difficult to distinguish from carcinoma, and not necessarily indicative of active disease elsewhere — syphilis, tuberculosis and actinomycosis.

It certainly is not appropriate for me to discuss with you the differential diagnosis of these disease processes, nor shall I attempt to describe such definitely local conditions as leucoplakia, tumors, benign or malignant, cysts or congenital abnormalities. In connection with syphilis, besides gummata of soft parts or bones, we must always remember that occasionally the primary lesion is encountered in the mouth, always, as you recall, a slowly developing ulcer on an indurated base with a secondary firm enlargement of at least one regional lymph node. Far more important, however, than either the primary or the tertiary luetic lesions, because of their frequency and their highly contagious nature, are the secondary manifestations, the so-called mucous patches with which you are familiar as filmy whitish areas occurring on any of the oral or pharyngeal membranes.

Among other infections of the mouth and throat that must be mentioned as connected with general disease are: — acute follicular tonsillitis, including the severer form known as "septic sore throat," scarlet fever, diphtheria and Vincent's angina. The throat of acute tonsillitis due to the hemolytic streptococcus and that of scarlet fever are usually identical, the etiological factor in both cases being a variety of the same organism. In scarlet fever, along with the exanthem, the papillae of the tongue become more prominent and desquamation of its

mucous membrane usually follows. The exudate, ordinarily located on or near the faucial tonsils, is distinguished from diphtheria by being as a rule less thick and dirty in appearance, less tenaciously adherent and surrounded by bright red mucous membrane instead of by a relatively narrow zone of dull redness. It is quite unsafe, however, to depend on this appearance in differentiating between the two and a culture carefully taken from under the edge of the exudate or membrane should always be obtained.

With Vincent's Angina as it affects the gums you are much more familiar than I, but with the lesion as it appears on the tonsils or pillars, possibly less so. When you see what is usually described as a "punched out" ulcer, covered by a dirty exudate on tonsil, pillar or thereabouts, especially when associated with a tender and painful lymph node below the angle of the jaw, you should think first of Vincent's Angina and attempt by direct smears from the crater of the ulcer to identify the spirochete and fusiform bacillus. It is well to remember, also, in this connection, that ulcerative lesions of the throat, often showing spirochetes and fusiform bacilli are seen as secondary manifestations in general disease. This is especially true in two important conditions in which changes in the blood picture are prominent. One of these is known as infectious mononucleosis or glandular fever. In most of these cases, sore throat is present and often there are ulcerations which may, as we have just stated, show the Vincent's organisms. Three characteristics distinguish this disease: first, the presence of enlarged and usually tender lymph nodes, almost always in the posterior cervical region and at times also in the axillae and groins. Second, the characteristic blood picture, in which there is a positive lymphocytosis with many "abnormal" forms of lymphocytes and third, the occurrence in the blood of agglutinins for sheep cells in high concentration, as has been shown by Paul and Bunnell at New Haven, and which is the basis of a diagnostic serum test for this disease which we have found, as they have, to be highly specific. In view of the fact that this benign and self limited condition may easily be mistaken both in its clinical appearance and its blood picture for the uniformly fatal lymphatic leukaemia, a definite diagnosis is of the greatest importance.

The other important disease with marked blood changes and usually ulcerative throat lesions is known variously as agranulocytosis, agranulocytic angina and malignant neutropenia. As the name

suggests there is usually a throat inflammation or angina which is ordinarily a spreading ulceration with considerable necrosis. Here again a blood examination shows, as the term agranulocytosis suggests, a marked reduction or practical absence of granular leucocytes and results, unless production of these cells takes place, in a speedily fatal issue.

#### *Oral Manifestations of Diseases of the Skin*

Many diseases of the skin also affect the oral mucosa. Among these may be mentioned lichen planus, lupus erythematosus, erythema multiforme, angio-neurotic edema, and pemphigus. While usually characteristic lesions on the skin give the key to the nature of the condition within the mouth, at times these diseases may appear first intra-orally and in rare instances no other manifestations whatever may be present. Papules, occurring especially on the buccal mucosa with at times circular or conglomerate patches on the tongue or lips suggest lichen planus. In lupus erythematosus the lesion assumes varying forms which are described in the text books. On the tongue, where they are not very uncommon they may occur as grayish or reddish spots or patches, many of which ulcerate and resemble tuberculosis as it occurs in the same region. A very important skin disease with mouth manifestations is pemphigus. As you will remember, this condition is of unknown origin, is characterized by blebs and bullae on the skin surfaces, a profound systemic reaction and often a fatal outcome. It is well to recall that in the early stages the lesions may be confined to the mouth, in which case there are blebs and ulcers of the mucous membranes which usually become grossly infected and covered with membrane and tend to resist all treatment and to reappear persistently. The writer has recently seen in consultation two such cases in one of which the patient had been for a long time treated by his dentist for a supposed Vincent's infection. In both, the lesions were resistant to all forms of treatment that were tried and both ended fatally.

We may mention at this point a very common disease with important mouth manifestations — measles. Here we have an eruption appearing usually first in the mouth — the well known Koplik's spots, so easy to describe on paper but so hard to recognize unless one has seen them again and again. Small bluish white points, each on a red base, later becoming whitish, numerous and less characteristic, usually best seen on the buccal mucosa — this is perhaps as good a description as we

can give — but when seen in a person with an obvious coryza, a fever, a distinctly reddened soft palate and enlarged cervical lymph nodes, measles should be at once suspected.

#### *Drugs*

Just as diseases of the skin often have mouth manifestations, so rashes produced by drugs often also involve the mucous membranes of the mouth. The salicylates, acetyl salicylic acid (aspirin), acetanilid and antipyrin and their derivatives, the barbituric acid compounds, such as pheno-barbital (luminal), veronal, etc., phenolphthalein, quinine, arsphenamine and potassium iodid all fall within this category. With the iodid eruption salivation and an irritation of the throat and tonsils is often a troublesome feature. Of the drugs in which intra-oral changes are most important and characteristic we may name benzol, lead, bismuth and mercury.

Benzol poisoning produces a serious and often fatal aplastic anaemia. The intra-oral changes are those of severe anaemia to which we will allude later on. Lead poisoning produces the well recognized deposits in the gums known as the lead line. These are gray or black dots, arranged in a row usually about one millimeter from the free edges of the gums. As Cabot states, the term "blue line" is somewhat unfortunate. Both bismuth and mercury can produce severe stomatitis. Both are widely used in the treatment of syphilis and the former also in the treatment of sinuses and sometimes in radiographic work. The stomatitis of bismuth usually is characterized by a violet to black pigmentation and with both bismuth and mercury the process may go on to marked ulceration and secondary infection. In mercurial stomatitis salivation is an early symptom and indicates that tolerance for the drug has been exceeded. Later swollen and bleeding gums followed by actual ulceration will be found if the medication is not discontinued.

#### *Endocrine Disorders*

The only two disorders of the organs of internal secretions that ordinarily show definite intra-oral changes are hypothyroidism and Addison's Disease. In the former the tongue is thickened and seems to overfill the mouth (seen in its most marked form in congenital cretinism). Addison's Disease, caused by adrenal failure, usually due to tuberculosis of those organs, is evidenced by marked weakness, arterial hypotension and skin pigmentation—and in this disease the discovery of pigmented areas on the oral mucosa is a very important diagnostic finding.

#### *Deficiency Diseases*

In dealing with disease caused by lack of those dietary factors known as vitamins it is well to remember that it is probable both that partial vitamin lack may be present in many clinical conditions, especially those in which the absorptive powers of the digestive tract are impaired, and also that some diseases which manifest marked changes in the blood are due in part to vitamin deficiency. The best examples of this latter type are pernicious anemia and tropical sprue.

Of the conditions, however, that are classed primarily as deficiency diseases the most important for our consideration are scurvy and pellagra. Scurvy, or scorbutus, is due, as is well recognized by all, to the lack in the diet of vitamin C. This vitamin, which is the most delicate of all the vitamins, being easily destroyed by heat and by drying, occurs especially in fresh vegetables and fruit and to a less extent in fresh milk and meat. The disease is characterized by anaemia, loss of weight and hemorrhages from the mucous surfaces, under the skin and under the periosteum of the long bones. The most marked intra-oral manifestation is the change in the gums which become hypertrophied and soft and often bleed considerably. In the matter of differential diagnosis the condition is to be distinguished from the following diseases, in all of which a rather similar appearance of the gums is to be found—purpura, leukaemia and mercurial poisoning. The history of the insufficient diet is of course diagnostic and the other diseases are distinguishable by blood changes, especially the lack of blood platelets, in purpura, by the characteristic blood picture in the leukaemias and by the history of anti-syphilitic treatment in mercurial poisoning. It is well to remember that mild or slight cases of scurvy can occur and in our patients with swollen and bleeding gums to inquire carefully as to their dietary habits with reference to the intake of articles known to be rich in vitamin C.

In pellagra we are dealing, according to the opinions of most investigators, with the lack of another vitamin—designated as B<sub>2</sub> or G (the pellagra preventing substance of Goldberger). This vitamin occurs in fresh milk, meat, some fruits and vegetables and especially in wheat germ and yeast. The disease is characterized by weakness, anorexia, diarrhoea and dementia in its later stages. Its most typical and diagnostic lesion is a symmetrical dermatitis commonest on the hands and wrists but occurring anywhere on the body. In the mouth, a sore tongue is a frequent and often an early finding.



This glossitis resembles that noted in pernicious anaemia in that there is usually atrophy of the papillae, and it may show in addition numerous superficial ulcerations. The resemblance to pernicious anaemia is more readily understandable when we realize that in most cases of pellagra gastric achlorhydria is present and also that in the causation of pernicious anaemia, as shown by the brilliant work of Castle, one of the factors may be a lack of a substance in the diet which Castle has named the "extrinsic factor" and which is apparently identical with vitamin G.

#### *Diseases of the Blood*

Pernicious anaemia, which from the foregoing must be considered in part a deficiency disease, shows, in the mouth, besides the evident pallor of mucous membranes, tongue changes resembling those just described. The smooth surface with atrophy of papillae is characteristic, and at times redness, swelling and even ulcerations may be present and merit the term glossitis. In the early recognition of this disease tongue changes are most important. The tongue of tropical sprue, a disease in which the blood picture may be identical with that in pernicious anaemia, may be quite similar but the tendency to ulceration and atrophy is described as being more marked. It should be kept in mind, however, that any profound anaemia, in which there is marked decrease or absence of hydrochloric acid from the gastric secretion, may show a tongue indistinguishable from the atrophic stage of the glossitis of pernicious anaemia.

Marked pallor of the oral mucosa, which of course suggests profound anaemia, but not necessarily associated with any definite tongue changes is seen in the anaemia of severe or repeated hemorrhages, infestation with *dibothriocephalus latius* (fish tape worm) and hookworm, the anaemia of malignant disease, benzol poisoning, and in two types of anaemia of unknown origin; namely, the so-called aplastic anaemia and that form of chronic anaemia seen especially in women which is usually called idiopathic microcytic anaemia. The last named is probably the same condition that is called chlorosis in young females and is readily amenable to large doses of iron. In this condition and also in gastric carcinoma, achlorhydria is frequently present with an accompanying atrophy of papillae of the tongue suggesting the picture in pernicious anaemia.

Of the other blood conditions which might be suspected on an examination of the mouth, polycythemia, the opposite of anaemia, may be men-

tioned in passing. In this rather rare disease, the number of red corpuscles and the percentage of hemoglobin is actually increased well above normal limits. The condition is ordinarily evidenced by a cyanosis like that of cardiac or pulmonary disease which is usually seen in the purplish appearance of the lips and tongue.

Purpura, which, as you know, is characterized by a tendency to subcutaneous and submucous hemorrhage, due to an interference with blood coagulation, shows bleeding and swollen gums, often as has been mentioned, resembling those of scurvy, and the differential diagnosis of the two conditions may be quite difficult.

Last, but by no means least, in our catalogue of morbid conditions meriting our consideration because of definite intra-oral changes we shall mention the leukaemias. These are apparently in their essence tumors, the one of the lymphoblast, the other of the myeloblast, in which the tumor cells differentiate sufficiently to multiply freely in the blood stream. Both are uniformly fatal. The diagnosis depends upon the recognition of the characteristic changes in the blood picture but in the lymphatic form it is not very uncommon to find cases in which for long periods the total leucocyte count is not increased, (the so-called a-leukaemic stage.) The disease is often difficult to recognize in this form. The intra-oral changes for which one must be on the lookout are general anaemia of the mucosa and bleeding from the gums. This hemorrhagic gingivitis may be, especially in acute myelogenous leukaemia, the first sign of trouble noted by the patient. For this reason it is not uncommon for a patient in the early stages of this disease to turn first for help to his dentist.

In conclusion let us re-emphasize the fact that many serious general diseases often show early and striking intra-oral signs which at times may be the only positive findings suggesting the diagnosis. Besides obvious local disease such as the lesions of tuberculosis, syphilis, scarlet fever and so forth, we must recognize the perhaps less striking secondary changes in gums, tongue and elsewhere which are of actually greater importance in that they are more likely to remain unrecognized at the dental examination. In particular, marked anaemia of the mucosa, ulcerative or atrophic glossitis, hemorrhagic and ulcerative gingivitis and stomatitis demand investigation. By the early recognition of the possible general implications of these local appearances the dental specialist can render a very great service to his patient.

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## EDITORIALS

### MUMMERY, MUSIC, AND MEDICINE

We are not privy to the details of Mr. Tugwell's proposed substitute for the so-called National Pure Food and Drugs Act, but we hope it contains adequate provision for controlling the advertising as well as the package labelling of drugs, cosmetics, and nostrums. We are thinking particularly of the present widespread use of the radio for disseminating the publicity blurbs of the patent medicine makers. One can hardly tune in on any program

for more than a few minutes without being invited, nay urged, to try So-and-So's skin cream (for acne, seborrhoea, pruritus, eczema, impetigo and psoriasis), or This-and-That mineral water concentrate (for obesity, high blood-pressure, headaches, dizziness, constipation, and most of the other ills of civilized man.) Such publicity is bad for two reasons: first, a part of it is definitely misleading; second, all of it may tempt persons suffering from serious maladies to dangerous experimentation in self-treatment. Now when we say that such advertising is misleading we do not mean that it is necessarily untruthful. Far from it. On paper it is undeniably veracious. But the adroit delivery of

some well-trained announcer can quite change its tone, and transform an innocent, half-apologetic little bid for recognition into a "message" bristling with unjustified promises and exorbitant claims. The listener, when the harangue is finished, is left with the impression of a definite promise of cure. He has no means of checking up on what the speaker has actually said, but he has a pretty good idea of its implications. And since the blurb is changed often, there is little danger of his getting a literal interpretation of it.

It is this insidious character of radio advertising that makes it the most dangerous tool of the nostrum-vendors. Doubtless it is not necessarily more deceptive in their hands than in those of any other commercial interests. But in matters pertaining to health, the public not only likes to be fooled, but likes to fool itself. Given the slightest encouragement, people will believe that symptomatic treatment with patent medicines of the "quick relief" type can cure the most serious conditions. And nobody knows this any better than the sponsors of Cough Syrup Hours on the radio.

The public, therefore, needs protection not only from the innuendos of unscrupulous advertisers, but from its own gullibility and self-deception as well. If it is not asking too much of the New Deal, we would like to suggest that future food and drug legislation should include such protection.

### O TEMPORA! O MORES!

Recently a young *Interne* was heard to remark, in discussing a highly respected colleague, "He will never be successful because when he gets a patient that has no disease he frankly says so, instead of 'stringing him along' for a few months at five dollars for weekly office visits."

One cannot help but wonder that a graduate of a reputable Medical School should so far forget his training as to convict himself of dishonest ethics by such an attitude. Fortunately that does not represent the opinion of the profession in the matter of honesty and fair dealing, and Rhode Island holds no place for a Doctor with such ideas of integrity as a basic principle in the practice of an honorable and honored profession.

The young man might well reflect that "success" in our calling is far more to be measured in our

ability to save life and suffering and our public and professional reputation than in deflated media of exchange.

The cardinal virtues of sobriety, industry, self sacrifice, and honesty are still and will always remain the pillars of our professional integrity which we constantly guard.

The young man who starts out in life dishonest with his patients, is dishonest with himself and unfair to his sacred calling, and colleagues. Just as the newspapers continually scream in headlines "Crime does not pay," let us shout to our *Internes*, "Fidelity to your sacred trust is the sole basis upon which you may practice Medicine amongst us."

Thank God, Medicine is not yet a business, but still a profession.

### THE MECHANICS OF PEPTIC ULCER PAIN \*

(AN EXPERIMENTAL AND CLINICAL STUDY)

By RUSSELL S. BRAY, M.D.†  
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Our interest in the problem of peptic ulcer pain was stimulated by the appearance in the literature of certain methods of therapy which have been advocated for the treatment of peptic ulcer. The primary object of ulcer therapy is to afford relief from pain, the ultimate object being the healing of the ulcerous process. This investigation is concerned only with the mechanics of ulcer pain; that is, the manner in which pain is produced and the reaction of the pain mechanism to those remedies which frequently afford relief.

In our experience, the many varied and seemingly unrelated therapeutic methods suggested for the treatment of peptic ulcer, have been about equally successful in affording relief from the painful paroxysms. The varying character of the remedies in common usage serves to emphasize the fact that the precise nature of ulcer pain is still in some dispute. It therefore occurred to us that this cardinal symptom of peptic ulcer would afford an

\*From the clinic of Gastroenterology, Department of Medicine, Charles V. Chapin Hospital. Read at the June meeting of the Providence Medical Association, 1933.

†The author wishes to express his appreciation to Professor I. R. Taylor of the Department of Physiology, Brown University, for his kind suggestions and criticisms of this work; and to Mr. William Bell, Jr., of the Medical School, McGill University, who so skillfully performed many of the experimental studies.

interesting problem for clinical and experimental study. We hoped that certain information might be obtained from the study of the normal and abnormal stomach which would lead to a suitable interpretation of the pathophysiology of peptic ulcer pain.

It is a well known clinical fact that the nature and severity of ulcer pain may be extremely variable. Perhaps most frequently the pain of ulcer is described as a feeling of emptiness accompanied by intense hunger — this syndrom constituting the classical "hunger pain" of Moynihan. Although the pain of ulcer may vary in character, it has one universal trait: that is, it always bears a direct relation to some phase of gastric digestion. It has been customary in evaluating the symptom of pain, to regard the time of onset of pain in relation to food, as being indicative of the type and location of the ulcerous lesion. The location of the lesion in the gastro-pyloro-duodenal tract has little significance in so far as the periodicity or time sequence of pain is concerned. The factor of periodicity is so readily altered by the type and quantity of food ingested and by other associated organic changes, that it cannot be regarded as having any great value in determining the character or location of the lesion. The mechanics of ulcer pain is the same, whether the ulcer is located at the cardia, along the gastric curvatures, or in the duodenal bulb. As Crohn<sup>1</sup> has pointed out, in interpreting the symptom of pain it is also essential to recall that individuals react in different degrees to the same pain stimulus.

It must be evident that the mechanics of ulcer pain is related to the problem of gastric sensibility. In health, the individual for the most part, is unaware of his stomach. He does not become conscious of his digestive process unless a distinct derangement of function exists. The only indication to the individual that his gastric functions are normal or abnormal is the state of his own sensations. Clinical experience compels us to believe that the stomach possesses a distinct sensibility of its own. According to Ryle<sup>2</sup> and certain investigators, the only sensations associated with the normal stomach are hunger, appetite, satisfaction, and repletion. Carlson<sup>3</sup> believes that the only physiological pains originating from the normal stomach are the pangs of hunger. Hurst<sup>4</sup> has shown the normal gastric mucosa to be insensitive to ordinary tactile, thermal, and chemical stimuli. An individual in good health is not conscious of the ordinary

fluctuations in gastric acidity. Therefore, we must assume that an individual becomes conscious of gastric pain only in the presence of deranged gastric function.

Although the symptom of pain is one of the most characteristic features of peptic ulcer, gastric pain however, is not in itself pathognomic of ulcer, as it is well known that pain similar to that of peptic ulcer may be produced by organic lesions distant from the stomach which by reflex action disturb gastric function. Although this fact is of great importance in the study of gastric pain we cannot discuss this aspect of the problem at this time. As it will be impossible to review the voluminous literature pertaining to the problem of ulcer pain, suffice it to say that to account for the painful paroxysms of ulcer, two hypotheses have been advanced:

- (1) That pain is caused by a hyper acid gastric secretion acting directly on the ulcer; and
- (2) That pain is caused by exaggerated peristaltic activity and states of increased gastric tone.

From the evidence presented by various investigators, it must be assumed that certain abnormalities of gastric secretion or motility are responsible for the production of ulcer pain. However, in order to evaluate the importance of these factors, we attempted to study the following phases of gastric physiology in the normal and abnormal stomach:

- (1) The character of the tonus contractions of the stomach muscle as peculiar to the fundus and antrum.
- (2) The effect on gastric motility of fluctuations in intra-gastric pressure as produced by the distended balloon.
- (3) The nature of the hunger contractions in health and their relation to the cause of ulcer pain.
- (4) The relation of the normal gastric secretion as stimulated by various test meals, to the function of gastric motility.
- (5) The effect of artificially produced hyperacidity on motility and gastric sensibility.
- (6) The manner by which alkali, food, and certain remedies in common usage, effect relief from ulcer pain.

Our work thus far has consisted of 230 observations made upon 38 individuals. The patients were selected from the gastro-intestinal clinic of the Charles V. Chapin Hospital and from private prac-



tise. This group was classified in the following manner:

- (1) 22 normal individuals (used for study of the normal stomach)
- (2) 16 individuals having a proven peptic ulcer (this group may be sub-divided as follows)
  - (a) 3 individuals with an ulcer of the lesser curvature
  - (b) 2 individuals with a gastro-jejunal ulcer (later confirmed at operation)
  - (c) 11 individuals with uncomplicated duodenal ulcer

We employed the balloon method which had been so successful in the hands of Cannon<sup>5</sup> and Carlson.<sup>3</sup> Modifications of this technique have since been described by various workers. We found the following method best suited to our purpose: a Rehfuß tube to which a thin rubber condom has been attached is introduced into the fasting stomach. A Levine tube is then introduced for the purpose of obtaining fractional aspirations of the gastric contents. The condom balloon is inflated with a measured quantity of air. The fluctuations in intragastric pressure produced by the contracting stomach muscle are registered upon a revolving drum. A mercury or water manometer may be enclosed in the circuit for the purpose of determining the changes in intragastric pressure. The complete apparatus is illustrated in the diagram (note—figure No. 1).

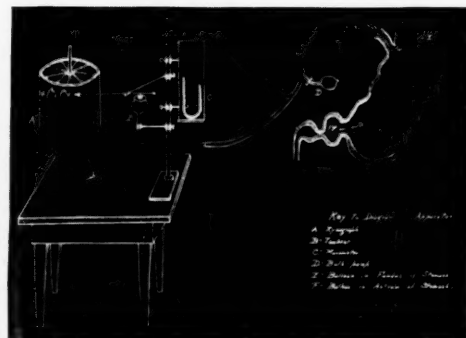


FIGURE 1. Arrangement and type of apparatus.

- A—Kymograph.  
 B—Tambour.  
 C—Manometer.  
 E—Balloon in fundus of stomach.  
 F—Balloon in antrum of stomach.

If a graph is to be considered as an accurate record of the motor activity of a specific region of the stomach, the position of the recording balloon

must be known and controlled by frequent fluoroscopic observations. This fact has not been sufficiently emphasized by certain investigators. The most difficult part of the experiment is the maintenance of the balloon at the desired level. We have, upon many occasions, observed a balloon originally placed in the antral segment displaced by vigorous peristaltic waves. It was thought that a balloon distended with water might remain in the desired position but we discarded this method because the tracings were not satisfactory. Even the weighted balloon may be displaced by vigorous peristaltic waves.

In a preceding paragraph we have tabulated certain aspects of gastric physiology which we believed to be directly concerned with the problem of ulcer pain. We feel that this program has served as an excellent approach to the problem, as the information obtained was of sufficient importance to at least justify an expression of an opinion as to the nature of the painful paroxysm. We deem it advisable to discuss the results of our observations in the following manner:

#### *Gastric Peristalsis*

Certain investigators have presented evidence which demonstrates the importance of gastric peristalsis in the causation of ulcer pain. However, as in the study of any pathological condition, a knowledge of the normal is essential to the intelligent interpretation of the abnormal. Alvarez<sup>6</sup> very aptly discusses the problem of normal gastric peristalsis as follows: "It is a remarkable fact that with all our advances in knowledge, we are still uncertain as to the exact way in which the waves of the stomach travel to the pylorus." It is apparent from this statement that there is still considerable doubt as to the manner in which a peristaltic wave traverses the stomach. The older writers taught that a peristaltic wave began as a shallow ripple near the cardia along the lesser curvature. This faint ripple reinforced by another shallow wave from the greater curvature, gradually deepens into an actual contraction as it progresses along the gastric contour. The peristaltic wave was thought to traverse the stomach until the upper level of the pars pylorica was reached. At this point the waves were assumed to contract so forcibly as to form a "transverse band" which served to almost divide the stomach into two distinct pouches. The upper pouch was thought to serve as a hopper for the

storage of food, while the distal pouch acted as a mechanical mixer or churner. The observations of Beaumont<sup>7</sup> and the experimental works of Hofmeister and Schutz<sup>8</sup> upon the excised stomach of the dog, were largely responsible for this earlier impression of gastric peristalsis. However, the observations of Cannon<sup>9</sup> and the additional roentgen-ray studies of Kastle, Rieder, and Rosenthal<sup>10</sup> largely discredit the existence of a distinct "transverse band," which separates the stomach into two independent functioning portions. It is the opinion of these observers that the peristaltic waves originating near the cardia travel all the way to the pyloric ring, the waves progressing uninterruptedly over the vestibule. Cole,<sup>11</sup> by using serial roentgenography, not only confirmed this belief, but offered the additional suggestion that peristalsis occurred in cycles. He classifies gastric peristalsis under five types, according to the number of waves present at any given moment.

In spite of the seemingly conflicting opinions, it is very probable that the contributions of the various observers afford a suitable explanation of gastric peristalsis. Barclay<sup>12</sup> aptly states his viewpoint of the subject as follows: "My own views on gastric peristalsis are that it varies so enormously, not only with the individual but from time to time in the same individual, that to attempt by a description or even a number of descriptions to represent the normal, would not be satisfactory—" Alvarez,<sup>6</sup> apparently is of the same opinion, for he considers the nature of gastric peristalsis a most confusing puzzle. There are many observers, notably Kelin,<sup>13</sup> Alvarez,<sup>6</sup> and Barclay,<sup>12</sup> who describe many varieties of peristaltic waves occurring in the same stomach. They have observed the distinct contractions of the antrum described by earlier investigators. Alvarez<sup>6</sup> offers the suggestion that this may be due to a difference in the rate of conduction of the wave in the two parts of the stomach. Time will not permit any discussion of the controversial subject of pyloric relaxation. Suffice it to say that a group of workers, notably (Cole, Hurst, Wheelon and Thomas, McClure, Reynolds and Schwartz) conclude that the sphincter, in the normal state, relaxes as each gastric peristaltic wave approaches the pylorus.

A phase of gastric peristalsis which demands consideration at this time, because of its suspected importance in the causation of ulcer pain, is that concerned with the production of hunger. Baldi-

reff,<sup>14</sup> Cannon and Washburn,<sup>5</sup> and Carlson,<sup>3</sup> have made an extensive study of the subject. Carlson has studied practically every phase of hunger in both health and disease. This observer has shown the feeling of hunger to be due to a series of peristaltic contractions of the stomach muscle. He describes the hunger contractions as actual peristaltic waves coursing from one end of the stomach to the other, beginning high up near the cardia and gradually involving the whole stomach.

Although our studies of the normal gastric peristalsis is still in progress, certain of our observations may be cited at this time. The balloon method as described in a previous paragraph was employed. Carlson<sup>3</sup> has shown that a uniform tonus rhythm is always present in the fundus of the empty normal stomach. We have, upon many occasions recorded the tonus rhythm of the fundus. In fact, in those individuals who failed to experience the sense of hunger the fundic tonus was the only evidence of gastric activity to be recorded. The tonus wave of the fundus as observed by us, is characterized by a series of uniform, shallow contractions of varying amplitude, and usually occur at 20-30 second intervals.

As there has been considerable dispute as to whether or not the antrum possessed a distinct center of tonus from which individual contractions could arise, we attempted to study the problem by introducing two balloons into the stomach, one localized to the fundus, the other in the antral segment. The balloons were attached to separate tambours and so arranged that the individual contractions would be registered upon a single revolving drum. Due to certain technical difficulties not easily controlled in the human being, the results of this experiment were somewhat variable. However, we have been able to obtain tracings which show that the majority of peristaltic waves arising



FIGURE 2. Double intubation. Upper line, balloon in fundus. Lower line, balloon in antrum.

from the region of the cardia course downward over the body and antrum of the stomach as continuous waves. Occasionally, less powerful contractions, apparently arising from the antral segment, were registered. It would be difficult to interpret these intermittent contractions which seem to bear no direct relation to the general peristaltic wave, in any other manner. These observations would seem to support in part at least, the opinion that at times peristaltic waves travelling from the cardia stop at the sulcus while a second wave arising from some portion of the antrum and travelling to the pyloric ring, completes the gastric cycle. Once the contractions involve the antral segment they usually become of greater amplitude and accompanied by increased tonus and intragastric pressure.

Cannon, Washburn, and Carlson have shown that the feeling of normal hunger is dependent upon contraction of stomach muscle. We have repeatedly observed and recorded the contractions of hunger. In order to obtain a record of the normal hunger contractions the intragastric balloon should be localized to the fundus. The graph obtained during the hunger phase shows certain characteristic features—the powerful contractions associated with the sense of actual hunger are always preceded by a series of shallow, ripple-like tonus contractions. At the beginning of the period the individual contractions occur several minutes apart, but as the feeling of hunger becomes more intense, the contractions are seen to occur in greater frequency and amplitude. The feeling of hunger occurs synchronously with the appearance of a series of powerful, rapid, peristaltic contractions. Each contraction lasts from 20 to 30 seconds and occur about a second apart. We have observed the hunger phase to end abruptly in tetany and by a gradual decrease in the frequency and amplitude of the contractions. The intra-gastric pressure produced by individual hunger contractions, in our series, varied from 8 to 10 m.m. of mercury.

The mechanical effect of the inflated balloon may be briefly stated: to obtain the most successful record of peristaltic activity the balloon should be inflated with as little air as possible. Twenty-five to fifty centimeters of air are usually sufficient. We have frequently produced an artificial hunger phase by increasing the air pressure of the balloon. The hunger period so produced; however, is of short duration and usually presents atypical features. Likewise we have produced the sense of gastric

pain by over-inflating the balloon localized to the antral segment.

Another phase of normal gastric physiology which is concerned with the problem of ulcer pain, is the manner in which food affects gastric motility and secretion. Certain investigators, notably McClure and Reynolds,<sup>15</sup> using a bariumized meal and fluoroscopy, conclude that a test meal introduced into the stomach is quickly subjected to the mechanical action of peristalsis. Our observations are not entirely in accord with this view. The effect of a test meal on gastric motility may be demonstrated by introducing into the stomach 200 to 400 centimeters of strained oatmeal gruel. With the balloon inflated to the proper pressure level, the following evolution of gastric peristalsis will be recorded—the fundus becomes quiescent immediately after the test meal is administered. In from 10 to 15 minutes a series of weak, shallow, tonus waves appear. These slowly and gradually give way to contractions of increasing frequency and vigor. As the stomach becomes nearly emptied, as determined by fractional aspirations of the gastric contents, contractions of greater frequency and amplitude appear. The subjective sense of hunger may occur at this time. We have also observed that the highest degree of free acid seemed to occur at the peak of gastric peristalsis; that is, during the stage of greatest peristaltic activity which apparently precedes actual evacuation. From our study of various test meals, such as water, milk, bouillon, crackers, olive oil, etc., we feel that the type and quantity of the meal ingested has a distinct effect upon the appearance time of peristaltic contractions and upon the rate of gastric evacuation.

#### *Gastric Peristalsis and Ulcer Pain*

The periodicity of the normal hunger contractions and their occasional association with the feeling of actual hunger pain, led certain investigators to study the relation of gastric peristalsis to ulcer pain. Ginsburg, Tumpowsky and Hamburger<sup>16</sup> studied a series of ten patients with peptic ulcer by the balloon method. They concluded that the powerful hunger contractions cause gastric pain in a hyperirritable condition of the stomach by increasing intragastric pressure. Other observers, notably Carlson,<sup>3</sup> Hardt,<sup>17</sup> Hertz,<sup>18</sup> Ryle,<sup>2</sup> Hurst<sup>4</sup>; as the result of intensive experimental and clinical study are convinced that pain in ulcer is dependent upon changes in muscle tension produced by hypertonus

and hyperirritability. On the other hand Palmer<sup>19</sup>, Ortmyer,<sup>20</sup> Reynolds and McClure,<sup>21</sup> believe that some mechanism other than gastric peristalsis must be present in order to satisfactorily explain the true mechanism of ulcer pain. It is quite evident from the foregoing remarks that there is a distinct disagreement among excellent authorities. However, we feel that certain conclusions are justifiable and our reasons for believing this to be so, may be summarized in the following paragraphs:

(1) The ease with which the painful paroxysms of peptic ulcer may be recorded by the balloon method seems to be dependent upon the pathologic state of the ulcer at the time of the experiment. It was most unusual to obtain evidence of pain during the period of apparent healing and quiescence. We occasionally produced pain by markedly over-inflating the balloon. The pain so produced resembled the true ulcer pain except for the shortness of the painful period. Apparently as soon as the stomach (antral segment) became readjusted to the increased intragastric pressure the pain stimulus was abated.

(2) It may be assumed that the ulcerous process is in a state of marked activity during the period of actual gastric pain. We were successful in obtaining satisfactory records of the pain mechanism in several individuals suffering from actual pain at the time of the experiment; that is, during the stage of ulcer activity. The balloon, inflated with a small volume of air was localized to the antral segment and its position verified during the experiment by frequent fluoroscopic observations. In every instance of subjective pain, unusual peristaltic contractions were recorded. We are not in accord with the view that the peristaltic contractions associated with ulcer pain are similar to those observed during the period of normal hunger. The sense of pain and normal hunger are unquestionably associated with increased gastric peristalsis, but are dissimilar in mechanical expression. A feature common to both gastric pain and normal hunger are powerful and frequent peristaltic waves; however, painful contractions occurred irregularly and the amplitude of the contraction varied as to the intensity of the pain. Painful peristalsis lack the rhythmicity and the phase of gradually increasing tonus which is so characteristic of the normal hunger period. The patients described their sensation of pain not as intense hunger, but as a feeling of emptiness, gnawing or boring, cramp-like pain.

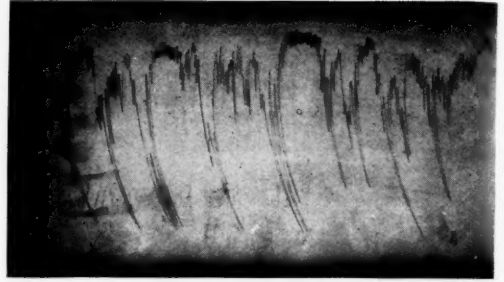


FIGURE 3. Typical contractions of ulcer pain.

The antrum was usually in a state of hypertonus during the feeling of pain, the graph revealing a stepladder pattern of painful impulses. During the pain free intervals, the peristalsis was of the normal type. In a few instances the pain was so intense as to necessitate the removal of the balloon. We noticed upon several occasions as the balloon was displaced from the antrum to the fundus, that even though the painful sensations continued the contractions were not similar to those obtained during the antral localization.

(3) The clinical value of any form of therapy advocated for the treatment of peptic ulcer is largely dependent upon its pain relieving qualities. As many of the remedies prescribed for this purpose are pharmaceutically dissimilar, it is difficult to understand how they accomplish this common objective. As the opportunity occurred, we attempted to study the effect of certain remedies upon the pain producing mechanism. The balloon method was employed and the remedies administered during the phase of ulcer pain. Although this study is still in progress we have obtained information concerning the effect of the following substances: gastric mucin, oatmeal gruel, milk and cream mixtures, olive oil, alkali, atropine and adrenalin. As time will not permit a discussion of the effect of the individual substances suffice it to say that the feature characteristic of the group was a marked inhibition of gastric peristalsis. During this period of peristaltic quiescence the patient was invariably free from pain. Fractional aspirations of the gastric contents were performed until gastric evacuation occurred. It was interesting to note that in spite of progressively mounting degrees of free hydrochloric acid the individuals remained free from pain until the meal had been evacuated. The neutralizing effect of the test meals employed



was slight and transient, the usual hyperchlorhydria occurring before complete evacuation of the meal. Olive oil produced the longest period of peristaltic quiescence and was the only substance producing an apparent neutralization of free acid. Atropine, administered subcutaneously, did not produce the rapid, striking effect characteristic of the substances administered orally. Adrenalin caused a spectacular, almost instantaneous, complete inhibition of peristalsis and relief from pain.

#### *Gastric Secretion and Ulcer Pain*

For many years it has been thought that the pain of ulcer was due to the presence of a chemical irritant; namely, free hydrochloric acid. Clinical experience has no doubt been largely responsible for this prevalent opinion, for it is common knowledge that ulcer pain can usually be effectively relieved by the administration of some form of alkali. However, when this aspect of the problem is subjected to experimental study the results leave the investigator in considerable doubt as to the actual importance of gastric acidity in the production of ulcer pain.

Of the numerous investigators who have studied this problem the work of Palmer<sup>19</sup> remains outstanding. This observer reports a very definite relation between gastric acidity and ulcer pain. He found that the introduction of 200 c.c. of 0.5 per cent hydrochloric acid into the stomach of a patient with an active, sensitive ulcer usually reproduced the characteristic ulcer pain. However, other investigators, namely, Hurst,<sup>4</sup> Ryle,<sup>2</sup> Hardt,<sup>17</sup> Herzt,<sup>18</sup> are of the opinion that gastric acidity is not an important factor in the causation of ulcer pain.

We have been unable to confirm the conclusions of Palmer. Using a group of normal individuals as controls, we introduced through a Rehfuß tube 200 c.c. of 0.5 per cent hydrochloric acid. The solution invariably produced a rather distressing sen-

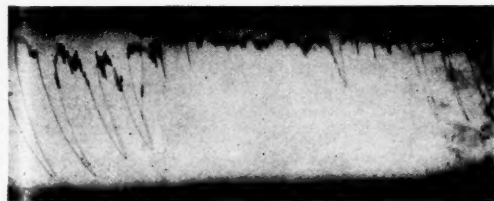


FIGURE 4. Demonstrating effect of 0.5 per cent Hydrochloric Acid during ulcer pain. Note inhibition of pain contractions.

sation of warmth and burning. A few individuals were unable to tolerate the irritating acid solution and quickly vomited it. In no instance was actual gastric pain produced. The experiment was then performed upon our patients with active peptic ulcer. The same distressing burning sensation occurred as in the control group, but in no instance was the ulcer pain reproduced. The acid solution was then introduced during the painful paroxysms, with the intragastric balloon in situ. The acid solution caused a moderate inhibition of peristaltic activity, the pain of ulcer being replaced by the sense of epigastric burning. The burning sensation remained until the solution was removed by aspiration or neutralized by alkali. Hardt<sup>38</sup> has found that the pain of ulcer could often be relieved by the administration of acid.

It was interesting to learn that the sense of epigastric burning or clinical "heartburn" associated with hyperacidity was in no way related to a state of gastric hyperperistalsis or increased tone. As this symptom invariably occurred in the absence of hyperperistalsis, it may be assumed that certain degrees of acidity may in some manner irritate the sensory nerve fibers of a hypersensitive gastric

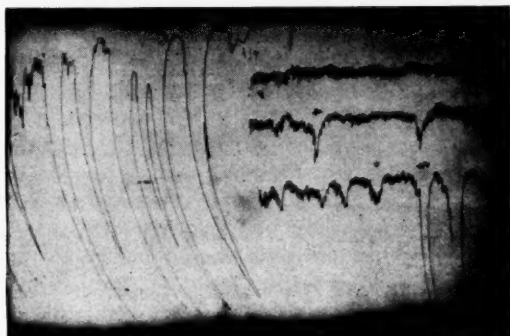


FIGURE 5. Demonstrating effect of Sod. Bicarbonate during ulcer pain. Note prolonged inhibition of peristalsis with gradual re-appearance of painful contractions.

mucosa. It is our impression that the beneficial effect of alkali upon the pain of ulcer may well be due to some factor other than neutralization. This problem is deserving of further study.

Certain clinical facts make it difficult to accept without qualification the acid theory of ulcer pain. Although hyperchlorhydria is the usual finding during a test meal study of an ulcer case, it is extremely rare to have a patient complain of ulcer pain even though the free acid mounts to excessive

degrees. It is not an unusual experience to find an even higher acidity during the period of ulcer quiescence than occurred during the stage of activation. Practically all alkalis afford but temporary neutralization and this period is frequently followed by a secondary rise in acidity without recurrence of pain. During experimental procedures ulcer pain may occur even though the acid gastric contents are being removed by fractional aspiration. Pain is quite characteristic of gastro-jejunal ulcer and yet one usually finds upon aspiration a gastric juice of low acid titre admixed with alkaline duodenal and pancreatic secretions. When an ulcerous lesion is accompanied by a hypersecretion of high acid titre, the complete removal of the gastric contents will often result in instant relief from pain. The pain mechanism in these cases is not quite clear though the pain may well be due to spastic states produced by acid. It has been our custom to avoid the use of alkali in the treatment of peptic ulcer. Only an occasional patient has required alkali therapy, while the vast majority have become symptom free when an effort has been made to relax spasm and inhibit exaggerated peristalsis.

An observation recently reported by Dragstedt<sup>22</sup> lends support to the acid theory of ulcer pain. This observer describes a case of "peptic" ulcer of Meckle's diverticulum associated with ulcer-like pain. It is assumed that the gastric mucosa lining the diverticulum secreted sufficient free acid to cause ulcer pain. It is to be regretted that more complete studies of the pain mechanism were not made. Aschmer and Grossman<sup>23</sup> advance the theory that the pain of ulcer may be due to the gastritis and duodenitis which they have found to accompany the ulcerous lesion. Meyer et al<sup>24</sup> believe that ulcer pain is due to gastritis and depletion of the vascular bed in and about the ulcerous area resulting in asphyxia, edema and pain.

#### *Comments*

Although our observations tend to support the mechanistic theory of ulcer pain, we are convinced that this difficult subject cannot be concluded with any degree of dogmatism. Pain of peptic ulcer seems to be dependent upon the following inter-related factors: An active, sensitive ulcerous lesion occurring in an individual sensitive to painful stimuli, a stomach in which a profound disturbance of the peristaltic rhythm exists, and possibly, a high degree of free hydrochloric acid. The exact

nature of the stimulus which initiates the painful paroxysms is still in doubt. We are convinced that the sense of actual pain arises from states of increased antral tension, hypertonus and hyperperistalsis.

The gastritis and duodenitis associated with the ulcerous lesion, and excess hydrochloric acid have been suggested as possible irritating factors which may initiate the pain mechanism. We have shown that the greatest peristaltic activity occurs just prior to gastric evacuation and the peak of free hydrochloric acid also occurs at this stage. This probably explains the postprandial occurrence of ulcer pain. Hyperchlorhydria must be regarded as an essential part of the "ulcer diathesis," but its exact role in the production of ulcer pain has not as yet been satisfactorily evaluated.

#### *Conclusions*

(1) An attempt was made to study those phases of normal gastric physiology which were thought to bear some relation to the mechanism of ulcer pain.

(2) As the result of experimental and clinical studies we feel that the majority of evidence is in support of the theory that alterations in gastric tone and peristalsis, are of prime importance in the etiology of ulcer pain.

(3) Hyperacidity must be regarded as a characteristic feature of the "ulcer diathesis." It may be assumed that under certain conditions hyperacidity may play an important role in the production of ulcer pain.

(4) The possibility of inflammatory and vascular changes about the ulcerous area as factors initiating muscular hyper-irritability can not be disregarded.

(5) The rationale of frequent bland meals in the treatment of active ulcer is apparent. Gastric peristalsis is most pronounced when the stomach is nearly empty or empty. The introduction of bland liquids or semi-solid foods tends to inhibit gastric peristalsis.

(6) The treatment of peptic ulcer, whether medical or surgical, should follow certain physiological principles. An effort should be made to correct disturbed gastric physiology; namely, spasticity, tension, increased gastric tone and hyperperistalsis.

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## SOCIETIES

## PROVIDENCE MEDICAL ASSOCIATION

The regular monthly meeting of the Providence Medical Association was held at the Medical Library, 106 Francis Street, Monday evening, March 5, 1934, at 8:50 o'clock. The records of the last meeting were read and approved. The Standing Committee having approved their applications, the following were elected to membership: Alan E. O'Donnell, Victor P. da C. Rego and Orland F. Smith.

Dr. Buffum reported for the Medical Relief Commission that a plan for medical relief had been accepted by the State Unemployment Relief Administration and that it had gone into operation today.

Dr. James W. Leech presented the following resolution which was so voted: That the President be empowered to appoint an unemployment relief committee for Cranston, consisting of five members, three of whom have their offices in Cranston, with a Cranston man for chairman. Also that the President be empowered to appoint a similar committee for East Providence consisting of five members, three of whom have their offices in East Providence, with an East Providence man for chairman. That these committees shall consider the advisability of adopting in their localities a plan for medical care of the unemployed under rules and regulations No. 7 of the Federal Unemployment Relief Administration and that these committees shall have the power to formulate such plans and to represent the Providence Medical Association in making agreements with the local relief administrators.

The President announced the deaths of Drs. W. F. Flanagan, Jeffrey J. Walsh and Joel Webb.

Dr. Charles O. Cooke reported a case of chronic empyema that had a four-stage thoracoplasty.

The first paper of the evening was by Dr. U. E. Zambarano on "Some Medical Aspects in the Treatment of Tuberculosis." The best treatment is early treatment. The exclusion of tuberculosis in diagnosis is not a simple matter. A history of hemoptysis, pleurisy, family tuberculosis, malaise, etc., is important. The physical examination may show nothing significant and the sputum will probably be negative. The X-ray findings are important. Early treatment is within the scope of the general practitioner. Sanatoria are important as the majority of patients need institutional care, bed rest being the keystone of treatment. Collapse therapy is often indicated and here there should be close cooperation between the medical man and the surgeon. The dietary should be well balanced. Climate is not important. He stressed the value of prophylaxis.

Dr. J. Murray Beardsley spoke on Pneumothorax and Phrenicectomy in the treatment of Pulmonary Tuberculosis. He felt that Pneumothorax had revolutionized treatment. The selection of cases is very important and requires the co-

operation of tuberculosis specialist, internist, roentgenologist and surgeon. Collapse therapy should be started early with unilateral pneumothorax the first choice. Phrenicectomy may follow this and among the indications are adhesions of lung to the diaphragm, basilar lesion and pulmonary hemorrhages.

In general collapse may be considered from two viewpoints, temporary or permanent and phrenicectomy is of the latter type. Dr. R. Glenn Urquhart of the Norwich State Tuberculosis Sanatorium spoke on Surgical Collapse Treatment of Pulmonary Tuberculosis. The disease should be essentially unilateral and other collapse methods should generally have been tried first with failure. The proper selection of cases is the all-important point. The chief contra-indications are disease of the acute exudative type or rapidly progressive disease, dyspnea, renal tuberculosis or untreated laryngitis. The operation has changed particularly in the last two years and may be complete or partial. A frequent and serious mistake has been to remove too many ribs at a time. Complete cases are usually done in three stages now with very long sections of rib well back to the vertebrae. Post operative compression by dressings is important. A very fine series of movies demonstrated the operations.

The papers were discussed by Drs. Gifford, C. O. Cooke, Campbell of Norwich, Kingman, Winsberg, Pinckney, Perkins and Wing.

The meeting adjourned at 11:00 P. M.

Attendance 135.

Collation was served.

Respectfully submitted,

PETER PINEO CHASE, *Secretary*

### NEWS ITEM

The JOURNAL notes with pleasure the election of Dr. Frank T. Fulton, a former president of the Rhode Island Medical Society, as president of the New England Heart Association. Early in his career, Dr. Fulton took a keen interest in the study of the heart in health and disease, being one of the pioneers in the use of advanced methods such as the ink polygraph and the electrocardiograph. This interest has continued unabated to the present, and this election is evidence of the position which Dr. Fulton has come to hold in this special field.

### BOOK REVIEW

#### CHRONIC INFECTIONAL EDEMA

During the past seven years, Franklin A. Stevens, New York (*Journal A. M. A.*), observed thirty-eight patients with recurrent infections resembling erysipelas. Half of these were infections of the extremities and half recurrent infections of the face. In the five patients in whom extensive and permanent edema of the extremities was associated with recurrent erysipelas or lymphangitis, the vascular and lymphatic circulation had been impaired by operations or disease prior to the onset of the infection. Four of the five patients with facial edema had infected antrums or ethmoidal sinuses. The importance of these infections is emphasized by the absence of similar infections among the fourteen patients in whom edema had not developed. Because of the similarity between the streptococcic and staphylococcic infections with edema, the author has employed toxic filtrates of staphylococcus in his patients with staphylococcic infections. Several series of inoculations have been given each patient. Beginning with dilutions of 1:200, subcutaneous injections have been given twice each week, increasing the dose gradually until 1 or 2 c.c. of undiluted filtrate could be tolerated. During the immunization a critical dose was reached, usually between 0.1 and 0.2 c.c. of undiluted filtrate, which caused redness, increased edema and swelling of the face. These reactions have been specific, occurring only with staphylococcus filtrates in staphylococcic infections, and with streptococcus filtrates in infections with streptococcus. If the amount of filtrate injected was reduced the reactions ceased, and subsequently, by gradually increasing the dose, 1 or 2 c.c. of undiluted filtrate eventually could be administered. Recurrences of infection occurred between series of inoculations. But with each series the edema and inflammation have receded until, at the present time, recurrences of infection have ceased and the faces are normal except for residual fibrosis. These patients have been tested intracutaneously also, with nucleoproteins of streptococcus and staphylococcus, with toxic filtrates and filtrates devoid of toxins; and filtrates devoid of toxin have been injected subcutaneously to evoke focal reactions.